

iPLUMES - Integrated Planetary Ultra-sensitive Molecular Emission Spectrometer (iPLUMES)

Completed Technology Project (2016 - 2018)



Project Introduction

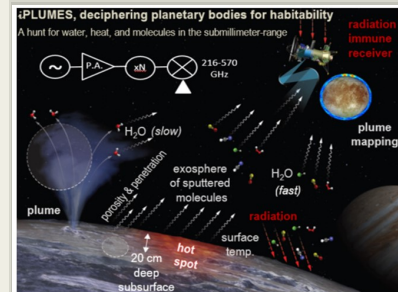
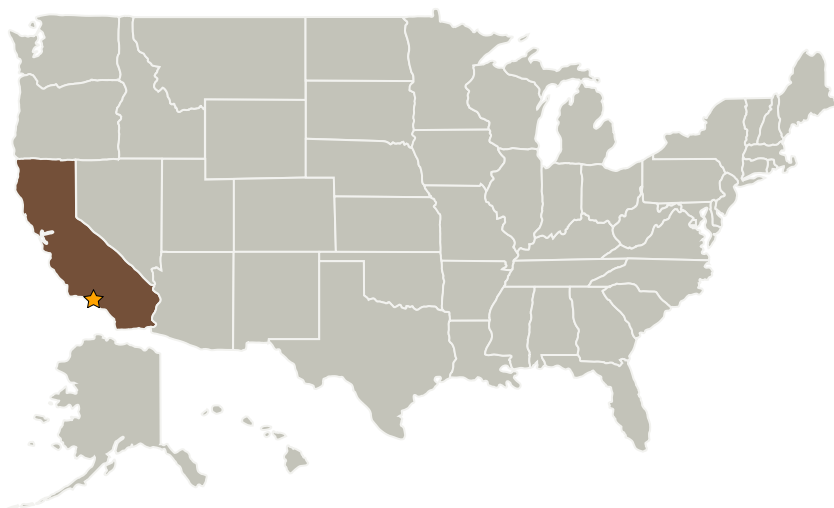
The proposed work will lead to a new generation of large-band submillimeter-wave planetary science instruments that can offer a higher science return than any competing approach. This is a high-risk/high-reward approach that will directly enable iPLUMES, an integrated Planetary Ultra-Sensitive Molecular Emission Spectrometer to provide early and reliable detection of plume activity, identify key exospheric molecular species, and measure surface and subsurface thermal gradients of planetary bodies.

The team is working to develop the Front-End Unit of iPLUMES, an ultra-large band room-temperature integrated high-resolution terahertz radiometer/spectrometer covering the 216-591 GHz band, with a 50% IF bandwidth and 30% improvement in sensitivity due to using an epitaxy wafer structure specifically optimized for this mixer. The receiver will be able to detect simultaneously key species to address habitability in planetary bodies.

Anticipated Benefits

The iPLUMES front-end will represent a major breakthrough in NASA's measurement capabilities of planetary bodies' surfaces and atmospheres. It will feature, for the first time, an integrated large-band room-temperature receiver covering the entire range from 216-591 GHz, enabling simultaneous observation of many key species such as salts (NaCl, KCl, MgCl, NaOH, KOH, MgO), carbon molecules (CO, CN, HCN, H₂C, CH₃CN, CH₃OH), water (H₂O, H₂18O, H₂17O, HDO), and sulfur molecules (H₂S, SO₂).

Primary U.S. Work Locations and Key Partners



iPLUMES science objectives

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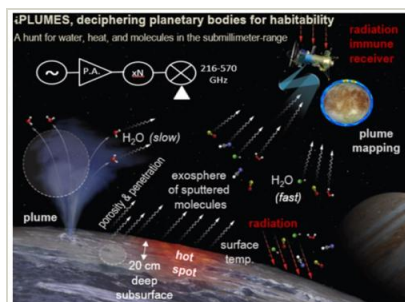


Organizations Performing Work	Role	Type	Location
★ Jet Propulsion Laboratory(JPL)	Lead Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations

California

Images



JPL_IRAD_Activities Project Image

iPLUMES science objectives
(<https://techport.nasa.gov/image/27902>)

Organizational Responsibility

Responsible Mission Directorate:

Mission Support Directorate (MSD)

Lead Center / Facility:

Jet Propulsion Laboratory (JPL)

Responsible Program:

Center Independent Research & Development: JPL IRAD

Project Management

Program Manager:

Fred Y Hadaegh

Project Manager:

Fred Y Hadaegh

Principal Investigator:

Jose Siles

Co-Investigators:

Goutam Chattopadhyay
Brian J Drouin
Choonsup Lee
Robert H Lin
Imran Mehdi

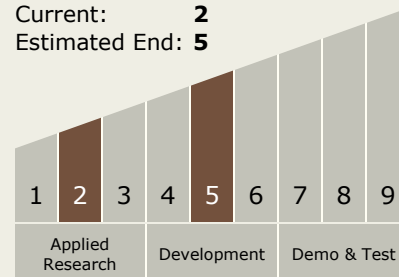
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Technology Maturity (TRL)

Start: 2
Current: 2
Estimated End: 5



Technology Areas

Primary:

- TX08 Sensors and Instruments
 - └ TX08.1 Remote Sensing Instruments/Sensors
 - └ TX08.1.4 Microwave, Millimeter-, and Submillimeter-Waves

Target Destination

Foundational Knowledge

Supported Mission Type

Push